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10/035,400	10/26/2001	Koji Yoshida	P/1071-1505	3376

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Keating & Bennett LLP
10400 Eaton Place
Suite 312
Fairfax, VA 22030

EXAMINER

RUGGLES, JOHN S

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 08/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/035,400

Applicant(s)

YOSHIDA ET AL.

Examiner

John Ruggles

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 14 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 October 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicants' submission filed on 14 July 2004 has been entered.

Claim 1 has been currently amended and claims 2-3 remain as previously presented. Therefore, claims 1-3 remain under consideration, as currently amended.

Drawings

The drawings are objected to under 37 CFR 1.83(b) because they are incomplete. 37 CFR 1.83(b) reads as follows:

When the invention consists of an improvement on an old machine the drawing must when possible exhibit, in one or more views, the improved portion itself, disconnected from the old structure, and also in another view, so much only of the old structure as will suffice to show the connection of the invention therewith.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must

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be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims, as currently amended. The insulator film must now be shown to cover the entire conductor film (not just a portion of the width of the conductor film as shown by limited sectional views that appear to be from a single perspective as exemplified by instant Figures 1F and 2H) or the feature(s) canceled from the claim(s). No new matter should be entered. For example, Applicants should have included additional drawings taken from additional orthogonal perspective sectional views, but these are not found in the instant drawings.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the

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drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

These new drawings objections have been necessitated by Applicants' amendment of claim 1, on which claims 2-3 depend.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-3 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contain subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 1 has been currently amended to now require, for the first time, that the entire conductor film must be covered during the insulating film forming step. This amendment was made in an attempt to overcome the previous art rejection based on Brebels in combination with other references as set forth in the previous Office action. However, this new requirement is not

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clearly supported in the original specification and raises the issue of new matter. While the limited sectional views of instant Figures 1F and 2H appear to show that the insulating film (4 or 14) cover the width of the conductor film (3 or 13), all of the instant drawings appear to be from the same single perspective. Thus, the instantly claimed new requirement that the insulator film cover the entire conductor does **not** find complete and specific support in either the text or the drawings, as originally filed. However, in order to advance prosecution and allow treatment on the merits, this new limitation has been interpreted to be present only to the extent that it is supported by the instant original drawings showing limited sectional views, all taken from a single perspective. Claims 2-3 depend on claim 1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brebels, et al. (US Patent 5,675,295) in view of Kornrumpf, et al. (US Patent 5,355,102), further in view of Carey, et al. (US Patent 5,219,787), further in view of Ohya, et al. (US Patent 5,686,172), and further in view of at least one of: Trinh, et al. (US Patent 5,132,648), Peterson (US Patent 5,574,415), and/or Kroger (US Patent 4,490,733).

Brebels teaches a microwave or millimeter wave (milli-wave) oscillator device (interpreted as a module) usable in a receiver, transmitter, transceiver, or other electronic component and a method of manufacturing the device (module, column 1 lines 7-11). The transceiver (also interpreted as a module) is designed for compactness (including a thin film circuit board having a pattern area of 5 cm² or less) and robustness (column 4 lines 35-37). The method includes forming a first metal (conductor film) on a substrate in a predetermined pattern by lift-off technology (column 8 lines 11-12). Lift-off technology is understood to mean that a resist is patterned on the substrate, the metal conductor film is formed over the patterned resist and substrate, followed by removal of the resist along with overlying portions of metal conductor to form the patterned metal conductor film. Column 8 lines 20-35 describe forming and patterning a photosensitive or non-photosensitive organic insulation layer (film of, e.g., polyimide, photosensitive benzocyclobutene (column 19 lines 25-34, e.g., photo-BCB), etc.) up to 10-20 microns (μm) thick to cover the metal conductor film. TiW/Au/TiW and Au are used as metal conductor film materials (column 8 lines 49-59). According to column 19 lines 22-44, thin film technology may be used to form an antenna; multiple layers of low dielectric loss (insulation layer) materials are built up (e.g., spun on, etc. – photo-BCB having a thickness in the range of 1-50 μm) to form an insulating film; and metal (e.g., Ti/Cu/Ti, etc.) layers are deposited (formed, e.g., by vaporization, etc.) on the substrate and patterned by conventional methods. Portions of a low dielectric constant (non-photosensitive organic insulating film) not covered by a patterned patch or feed line (not masked) are removed by dry etching (column 19 lines 66-67, instant claim 3). If photosensitive, the low dielectric constant material is spun (formed) 20 μm thick onto a substrate (of high dielectric material having a metal conductor film formed thereon),

baked by a hot plate, exposed to a pattern, developed, and baked (or cured, column 20 lines 1-6, instant claim 2). Note that by applicant's own admission on instant page 5, polyimide and benzocyclobutene inherently have stresses in the range of 15-60 MPa. Therefore, Brebels inherently teaches an insulating film stress in this range (as recited in instant claim 1) by teaching the use of these insulating film materials (e.g., polyimide, benzocyclobutene, etc.).

Also, Figure 18C of Brebels shows a limited sectional view for an embodiment in which the patterned low dielectric insulator 81 appears to cover the entire width of the underlying metal conductor feed line 86 (column 20 lines 12-23). Figure 18C appears to be most closely related to the limited sectional views of instant Figures 1F and 2H, which are taken from the same limited perspective. Thus, Figure 18C encompasses an insulator film covering the entire conductor film of instant claim 1, when limited to the same perspective as the sectional views shown by instant Figures 1F and 2H. Other orthogonal sectional views in this embodiment taken from additional perspectives are represented by Brebels' Figures 18A and 18B, showing portions of the conductor film 86 over which the insulator film 81 has been removed during patterning. However, these latter Figures 18A and 18B ***cannot be properly compared to the instant invention***, because the instant drawings only show limited sectional views taken from a single perspective and do not show any orthogonal sectional views from a different perspective.

While teaching the other limitations of instant claims 1-3 as discussed above, Brebels does not teach: (1) cleaning a ceramic substrate (as the high dielectric substrate) having a thickness of 0.05-2 mm and a flexural strength of 500-4000 kgf/cm² before coating and (2) alternatively forming the conductor film from at least one of Ag, Ni, Cr, Al, Nb, and/or V.

Kornrumpf shows a microwave thin film circuit having a ceramic (e.g., alumina, etc.) substrate, which is 25-100 mils (0.635-2.54 mm) thick and reads on the 0.05-2 mm thick ceramic substrate of instant claim 1. The 12.5-75 μm thick polyimide insulating film reads on the 20 μm or greater thickness insulating film of instant claim 1. A conductor film is patterned either (1) while being deposited or (2) first deposited as a continuous layer and then patterned by etching through a patterned resist layer (column 1, lines 28-60 and column 4, lines 6-43). Additional dielectric layers of polyimide or polyimide epoxy blend are formed over the earlier polyimide insulating film (column 10, lines 14-20 and column 11, lines 56-50). The microwave thin film circuit made by this method has a high density interconnect structure formed in a manner that provides close impedance matching, minimizes impedance discontinuities, and substantially increases the yield of good circuits (abstract).

Carey describes a process of trenching to form channels, vias, and components in a substrate, including a thin film circuit board or a high density multichip module (understood to include a waveguide, column 1, lines 50-59). The process includes cleaning an alumina ceramic substrate before coating with a polyimide insulating layer to assure acceptable contamination removal and coating adhesion (column 2, line 58 to column 3, line 4).

Ohya discloses a process of making a metal-foil-clad composite ceramic board (interpreted as a thin film circuit board) having greatly improved flexural strength applicable to a variety of fields where the excellent properties (e.g., physical, dielectric, etc.) of ceramic are essential (column 1, lines 1-28). The process of making the ceramic board includes curing the resin in a 0.1-6 mm thick resin-impregnated sintered ceramic substrate (column 5, lines 29-30), which reads on the 0.05-2 mm thick ceramic substrate of instant claim 1. Preferably, the flexural

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strength is at least 40-50 MPa (408-510 kgf/cm² or greater), because a 1 mm thick substrate having a flexural strength less than 40 MPa (408 kgf/cm²) would be fragile, in which cracking is liable to occur during handling or processing (column 5, lines 56-60 and column 11, lines 3-15). This encompasses the flexural strength range of 500-4000 kgf/cm² recited in instant claim 1. Specific examples of flexural strength for the composite ceramic substrate ranging from 46-181 MPa (469-1846 kgf/cm²) are shown in Tables 1, 6-1, and 6-2 found in columns 33 and 41. The metal for the foil is selected from copper (Cu), aluminum (Al), nickel (Ni), or various combinations of these metals (column 20, lines 42-49, for Ni (understood to include Ni-Cr alloy) and/or Al of instant claim 1).

Trinh teaches a monolithic microwave integrated circuit (MMIC, used as a microwave module for radio frequency communication) made with a circuit of highly conductive material (e.g., Ag, etc.) patterned on an insulating ceramic (e.g., alumina, etc.). This microwave integrated circuit has increased thermal stability and reduced mechanical stress (column 3, lines 5-55).

Peterson shows a multilayer microwave structure (understood to be a circuit) made by building up sequentially patterned metal (e.g., Cu, Cr, Al, etc.) and insulating layers of epoxy or polyimide using standard resist patterning with or without lift-off (abstract and column 4, lines 36-57).

Kroger describes millimeter wave and microwave detectors and mixers (again, understood to be circuits) having patterned conductor electrode layers made with superconducting metal alloy of a refractory metal (e.g., Nb, V, etc.) coated on insulating layers (column 4, lines 52-54, column 6, lines 36-37, and column 9, lines 33-40).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the photolithographic process of making a microwave or milli-wave module (or circuit) as taught by Brebels using a ceramic (e.g., alumina, etc.) substrate 25-100 mils (0.635-2.54 mm) thick (which reads on the 0.05-2 mm thick ceramic substrate of instant claim 1) as shown by Kornrumpf in order to form a high density interconnect structure in a manner that provides close impedance matching, minimizes impedance discontinuities, and substantially increases the yield of good circuits. In addition, it would have been obvious to clean the alumina (dielectric) ceramic substrate before coating with a polyimide insulating film to assure acceptable contamination removal and adhesion of the coating, as described by Carey. It would also have been obvious to use a ceramic substrate having a flexural strength of at least 408 kgf/cm² to avoid cracking of the substrate or circuit during handling or processing as disclosed by Ohya. This encompasses the flexural strength range of 500-4000 kgf/cm² recited in instant claim 1.

Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to manufacture the microwave circuit as taught by Brebels (Cu, Au, or Ti), Kornrumpf, Carey, and Ohya (Cu, Ni, Ni-Cr, or Al) using a conductor film made from at least one metal selected either from those already listed or alternatively from the following: Ag (taught by Trinh), Cr (shown by Peterson), Nb, and/or V (described by Kroger). This is because Brebels, Kornrumpf, Carey, Ohya, Trinh, Peterson, and Kroger all relate to the same art of circuit manufacture. This combination encompasses instant claim 1 for a conductor film including at least one selected from Cu, Au, Ag, Ni, Cr, Al, Ti, Ni-Cr, Nb, and/or V.

Response to Arguments

The drawings have now been objected to as failing to show every feature of the invention specified in the claims, as currently amended. These new drawings objections have been necessitated by Applicants' amendment of claim 1, on which claims 2-3 depend, and have been set forth above.

The current amendment of claim 1 also appears to add new matter, necessitating a new rejection under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement, for the reasons explained above.

Applicants' arguments with respect to claims 1-3 have been considered but are moot in view of the new ground(s) of objection and rejection, both as necessitated by amendment for the reasons explained above.

On page 5 of the submission filed on 14 July 2004, Applicants appear to be relying on Brebels' Figures 18A and 18B to show that some portions of the conductor film 86 are not entirely covered by the insulator film 81. However, these Figures 18A and 18B are orthogonal views of Figure 18C and ***cannot be properly compared to the instant invention***, because of the absence of any orthogonal sectional views in the instant drawings (i.e., all the instant drawings are limited to a single perspective taken at a particular cross-section). In fact, Figure 18C of Brebels shows a limited cross-sectional view from a single perspective for an embodiment in which the patterned low dielectric insulator 81 *appears* to cover the entire width of the underlying metal conductor feed line 86 (column 20 lines 12-23), just as recited in amended claim 1 (limited to the interpretation explained above). This limited sectional view in Figure 18C is most closely comparable to the instant limited sectional views of instant Figures 1F and

2H. Because it is believed that the instant drawings provide the **only** limited support in the specification as originally filed for the newly claimed requirement of forming the instant insulator film to cover the entire conductor film of instant claim 1, this new requirement must be interpreted as being limited to only the extent it has been exemplified in the limited sectional views of the instant drawings (all of which are taken from a single perspective).

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Furthermore, Brebels has not been cited alone, but rather in combination with Kornrumpf, Carey, Ohya, and at least one of: Trinh, Peterson, and/or Kroger. In at least Figure 2 of Kornrumpf, the second dielectric or insulator film 36 is shown to clearly cover all of the underlying metal conductor layers 32 and 34 (column 10 lines 49-53 and column 11 lines 46-48).

Therefore, despite Applicants' efforts to distinguish their invention over the cited prior art by amendment of claim 1, this effort has not been persuasive. For at least the foregoing reasons, instant claims 1-3 are still believed to be obvious variations in view of the previously cited art of record in this case.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



John Ruggles
Examiner
Art Unit 1756


JOHN A. MCPHERSON
PRIMARY EXAMINER